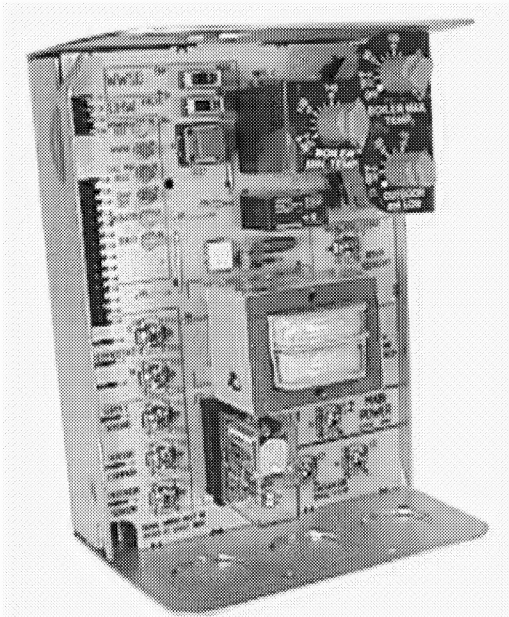


AQ475A Aquatrol Outdoor Temperature Compensator for Boilers

PRODUCT DATA



Features

- Adjustable settings for boiler maximum temperature, boiler minimum temperature and outdoor low (design) temperature.
- Selectable Warm Weather Shut Down (WWSD) at 70°F (21°C) to prevent summer boiler operation.
- Domestic Hot Water (DHW) priority.
- Replaceable circulator relay common to other Honeywell replacement controls.
- Supply and outdoor sensors included.
- Automatic boiler operating differential.
- Automatic system circulator exercising.
- Long-life DC relay drive control technology.
- Troubleshooting LEDs.
- Push-to-test button.
- Full size screw terminals.
- Functional replacement for Honeywell T475A Outdoor Reset Controller and W964F Aquatrol (on-off mode).

Application

The AQ475A Aquatrol Outdoor Temperature Compensator automatically regulates boiler water temperature to provide outdoor reset. The DHW Priority option operates the boiler at the Boiler Maximum Temperature setting to heat domestic hot water and can operate or shut down the system circulator. The boiler High Limit safety function must still be provided by the boiler manufacturer's high limit.

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Specifications

Important

The specifications given in this publication do not include normal manufacturing tolerances; therefore, an individual unit may not exactly match the listed specifications. Also, this product is tested and calibrated under closely controlled conditions and some minor differences in performance can be expected if those conditions are changed.

Model:

The AQ475A Aquatrol Outdoor Temperature Compensator automatically cycles the boiler to regulate heating supply water temperature using an outdoor reset curve. The AQ475A includes a supply and outdoor sensor, tie-clamp, mounting bracket and wire-nuts.

Electrical Ratings:

L1-L2 Power Supply: 120 Vac, 60 Hz, 1200 VA.
 C1-C2 Circulator Output: 120 Vac, 10 A; 1/3 hp (7.4 AFL, 44.4 ALR); 240 VA pilot duty powered contact.
 T-T Boiler Output: 24 to 120 Vac, 3.7 AFL, 22.2 ALR maximum; 240 VA pilot duty, isolated (dry) contact.
 DHW Demand input opto-isolated: 24 to 240 Vac.
 R-W Thermostat input: Dry contacts from thermostat or end switches; 24 Vac, 0.10 A.

Temperature Control Ranges:

Boiler (Supply) Maximum: 120°F to 225°F (50°C to 107°C).
 Outdoor Low (Design): -50°F to 30°F (-46°C to -1°C).
 Boiler Minimum: OFF, 80°F to 180°F (OFF, 27°C to 82°C).

Temperature Ratings:

Control: 32°F to 122°F (0°C to 50°C).
 Sensors: -50°F to 255°F (-45°C to 125°C).

Humidity Ratings:

Less than 90% RH, non-condensing.

Electrical Connections:

No. 6 wire clamp screw terminals.

Outdoor and Supply Sensors:

10 kΩ @ 77°F (25°C), NTC ±1%, beta = 3950.
 Lead Length: 42 in. (1067 mm).

Approvals:

Canadian Standards Association
 C/US Certified, LR: 95329-1

Dimensions:

See Fig. 1.

Cross Reference:

Functionally replaces Honeywell T475A Outdoor Reset Controller and W964F Aquatrol configured in on-off mode.

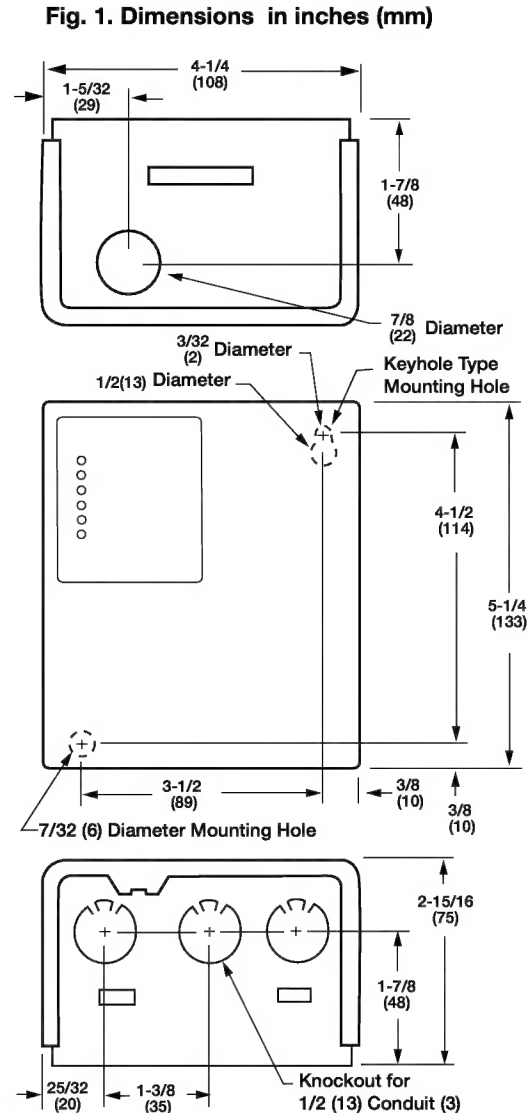
Thermostat Compatibility:

Contemporary Honeywell electromechanical and electronic 2-wire thermostats.

Replacement Parts:

32002190-001 Circulator Replacement Relay.
 32002100-001 Outdoor or Supply Sensor.

Fig. 1 AQ475A Approx. mounting dimensions in inches (mm)



Ordering Information

When purchasing replacement or modernization products from your wholesaler or distributor, refer to the price sheets for complete ordering number.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Home and Building Control Sales Office (check white pages of your phone directory.)
2. Home and Building Control Customer Logistics
 Honeywell Inc. 1885 Douglas Drive North
 Minneapolis, Minnesota 55422-4386 (612) 951-1000

In Canada - Honeywell Limited/Honeywell Limitée, 155 Gordon Baker Road, North York, Ontario M2H 3N7. 1-800-565-6282
 International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Installation

When Installing this Product

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.
5. Follow local codes for installation and application.

Wiring

Control



Caution

Electrical Shock or Equipment Damage Hazard.
Can shock individuals or short equipment circuitry.
Disconnect all power supplies before installation.

All wiring must comply with applicable local codes, ordinances and regulations. Refer to Fig. 3 through 9 for typical mechanical, wiring diagrams for the AQ475A. **Route wiring away from LEDs to avoid pinching wires under the bezel when reinstalling the cover**

Important

Use a maximum of 14 AWG wire for wiring terminals. All wiring must be rated for 300 V.

Important

Do not run sensor wires parallel or close to telephone or power cables. Cross all power and telephone wiring at right angles. If sensor wires are located in an area with strong sources of electromagnetic interference, use twisted pair, shielded cable, or run wires in a grounded metal conduit. When using shielded cable or conduit, connect the shield wire to earth ground **ONLY** at the AQ475A panel. **DO NOT** connect the shield (or conduit if used as a shield) to earth ground at any other location or electromagnetic shielding will be ineffective.

Connect 18 AWG (or larger) wire to the two sensor wires using the wire nuts provided. Wiring must be rated for 300 V.

Location

Control

Locate the AQ475A on a panel or wall near the equipment to be controlled. Make sure the location is accessible for installation and service and that the ambient temperature at the selected location does not exceed 120°F (50°C).

Mounting

To mount the AQ475A control:

1. Position the control on the wall at the selected location and mark the mounting holes. See Fig. 2.
2. Start a screw in the upper right corner for the keyhole type mounting hole. Screw it down within about 1/8 in. (3 mm) of the surface, or until the keyhole slot slides tightly on the screw.
3. Hang the control on the keyhole screw, position the case, and install the bottom screw.

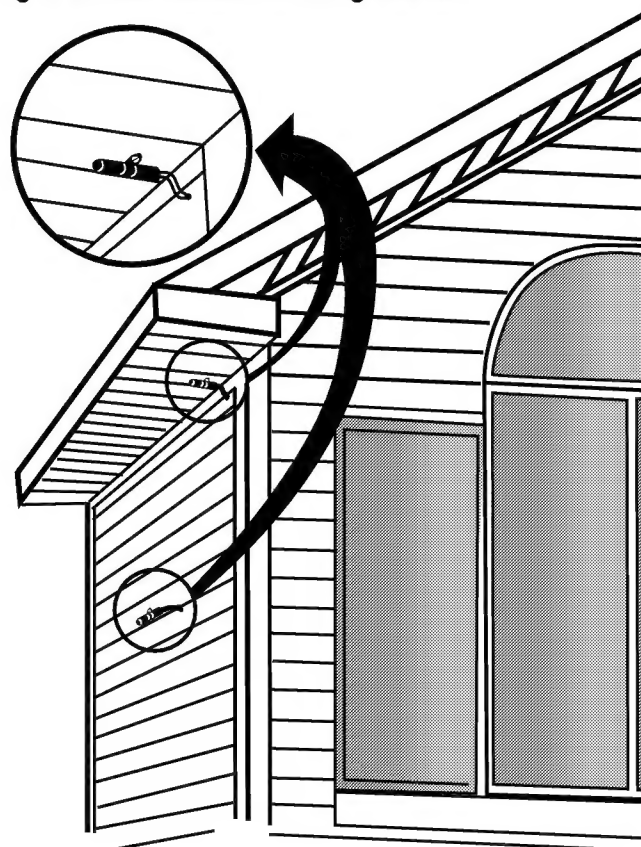
Outdoor Sensor

Locate the sensor:

- in a shady location out of direct sunlight.
- at least three feet from dryer, bathroom, or other vents.
- above the expected snow line where ice and debris cannot cover it.
- on the North side of the house.

See Fig.2 for typical placement.

Fig. 2. Outdoor sensor mounting location



To mount the outdoor sensor:

1. Place the sensor in the plastic mounting clamp provided.
2. Insert the screw provided through the hole in the mounting clamp and fasten the sensor in place.
3. Run an extension wire from the sensor lead wires to the control.

Insulate all connections and strain relief wires.

Location cont'd

Supply Sensor

The ideal supply sensor mounting location is in a well in the boiler shell. The supply sensor may also be mounted on the main supply pipe as follows:

1. Mount the sensor 3 feet (1 m) downstream from the main or primary circulator to ensure adequate water mixing. If the circulator is on the boiler return, mount the sensor after the first elbow away from the boiler supply outlet.
2. Secure the sensor with the tie-wrap (included).
3. Wrap the sensor with insulation and secure with high quality electrical or duct tape.

Settings

Reset Curve

It is not necessary to calculate the reset curve, the AQ475A calculates this automatically. To adjust it:

1. Set the Outdoor Low dial to the coldest actual winter temperature (design temperature, available from your local weather service).
2. Set the Boiler Maximum Temperature dial to the maximum for the desired heating supply water temperature (refer to manufacturer and industry recommendations for heating distribution, see Table 1).

Table 1. Typical Aquatrol settings for Heating Distribution Systems.

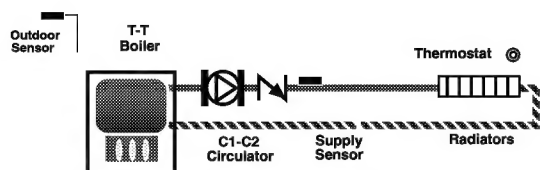
Distribution Type	Radiation Type	Boiler Maximum Temperature
Direct	Free-standing Radiator Baseboard Convactor	170-190°F (75-85°C) 180-200°F (80-90°C)
Fan Coil	Heating Only Heating/Cooling	150-180°F (65-80°C) 120-140°F (50-60°C)
Low Temperature	Floor Radiant Ceiling Radiant	90-110°F (32-43°C) 110-140°F (45-60°C)

The values of these two settings determine the maximum operating point for the heating system based on an assumed balance point of 72°F (22°C) for both supply water temperature and outdoor temperature. The reset curve will be overridden by either the Boiler Minimum Temperature setting or the DHW Demand input, which ever is active.

If the outdoor temperature falls below the Outdoor Low setting, the boiler operating temperature is limited to 10°F (5.5°C) above the Boiler Maximum Temperature setting.

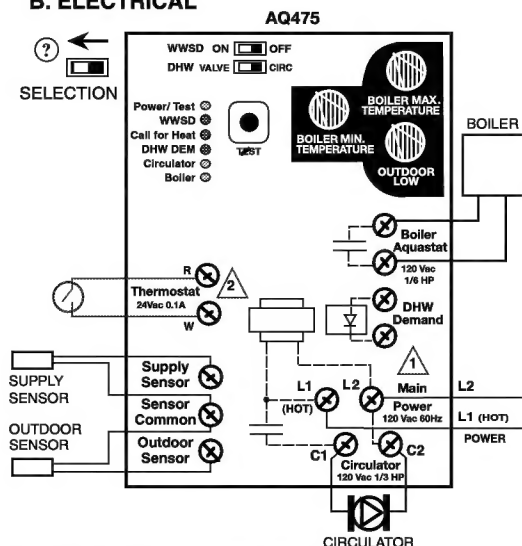
Fig. 3. Typical mechanical, wiring hookups for AQ475A with one zone, no domestic hot water.

A. MECHANICAL



Generic configuration does not show all accessories that can be used or that are required by local codes.

B. ELECTRICAL

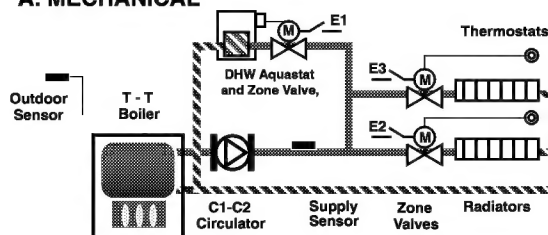


1 Power supply. Provide disconnect means and overload protection as required.

2 Anticipator Current 0.1A

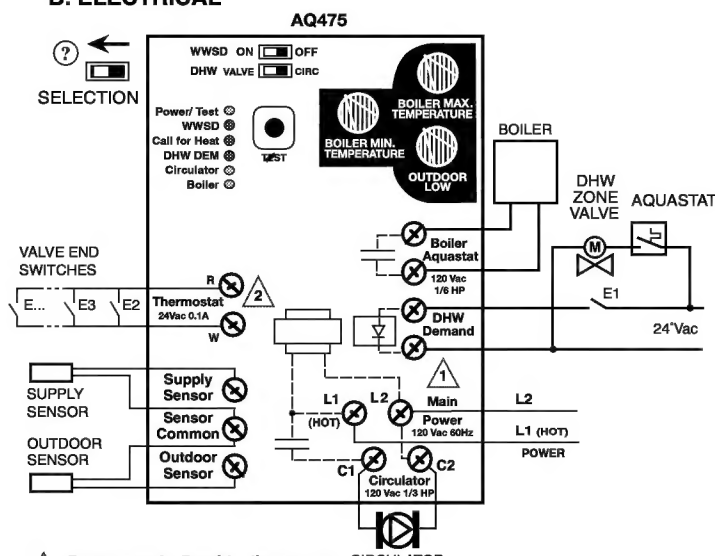
Fig. 4. Typical mechanical, wiring hookups for AQ475A with multiple zones, and domestic hot water valve.

A. MECHANICAL



Generic configuration does not show all accessories that can be used or that are required by local codes.

B. ELECTRICAL



1 Power supply. Provide disconnect means and overload protection as required.

2 Anticipator Current 0.1A

Notes:

- Radiators are a potential burn hazard if the *exposed surface* temperature is allowed to exceed 140°F (60°C).
- Discomfort results if radiant floor heating surface temperature is above 87°F (31°C). Building materials can also be damaged at high temperatures.

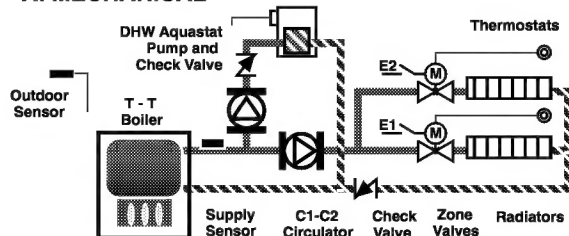
Thermostat Anticipator

Thermostat anticipator settings are based on the rate of temperature rise in the space. The hotter the supply water, the faster the thermostat needs to cycle to maintain accurate temperature control. The AQ475A Aquatrol supplies water just hot enough to heat the space, except when overridden by DHW Demand input or the Boiler Minimum setting. If *neither* feature is used, (re)set the electromechanical thermostat anticipator to *longest* and the electronic thermostat cycle rate to the lowest setting to prevent system short cycling.

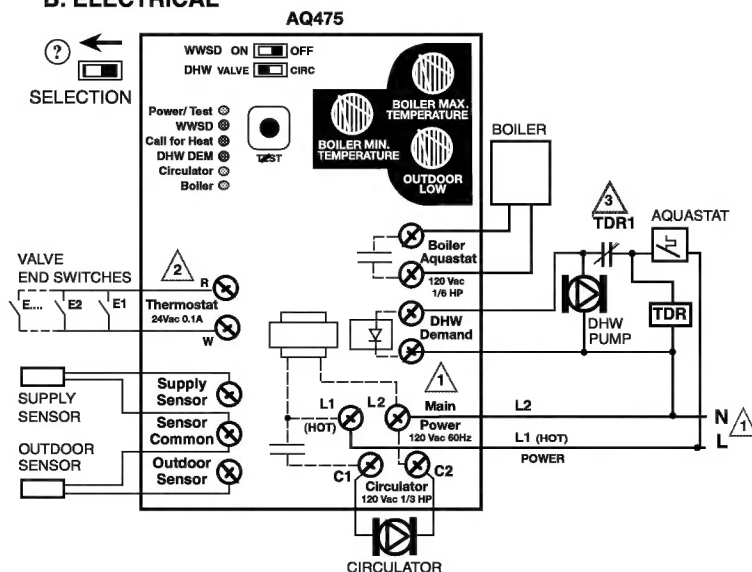
Thermostatic Radiator Valves (TRVs)

If the AQ475A is used with non-electric room controls such as thermostatic radiator valves, jumper the R-W thermostat input to simulate a constant call for heat; the TRVs will trim the space temperature for each zone.

Fig. 5. Typical mechanical, wiring hookups for AQ475A with multiple zones, domestic hot water circulator with priority.

A. MECHANICAL

Generic configuration does not show all accessories that can be used or that are required by local codes.

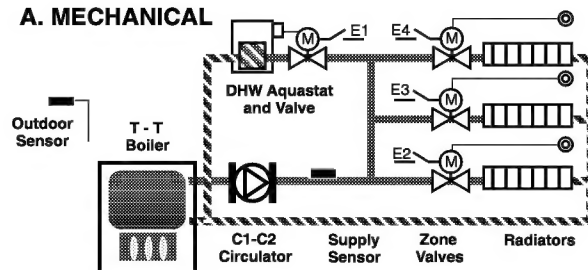
B. ELECTRICAL

1 Power supply. Provide disconnect means and overload protection as required.

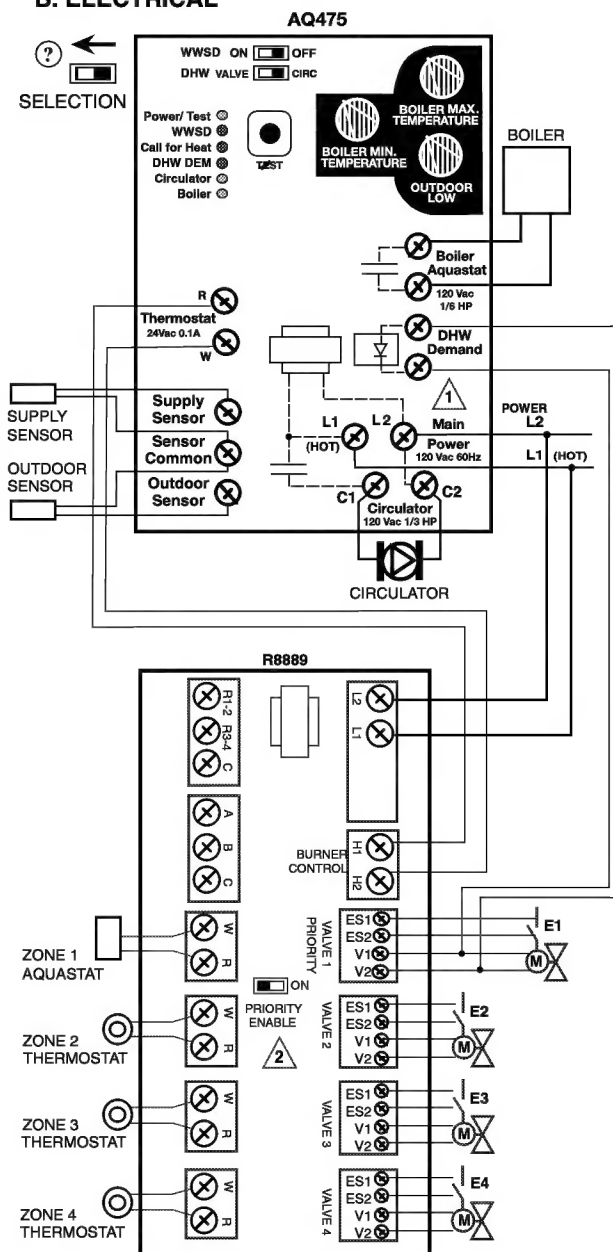
2 Anticipator Current 0.1A

3 20 -30 minute time delay optional to limit DHW priority over space heating

Fig. 6. Typical mechanical, wiring hookups for AQ475A, R8889 Hydronic Valve Zone Panel with DHW priority.

A. MECHANICAL

Generic configuration does not show all accessories that can be used or that are required by local codes.

B. ELECTRICAL

1 Power supply. Provide disconnect means and overload protection as required.

2 Slide PriorityEnable switch to ON for DHW priority.

Fig. 7. Typical mechanical, wiring hookups for AQ475A, DHW circulator with priority, R8889 Hydronic Valve Zone Panel.

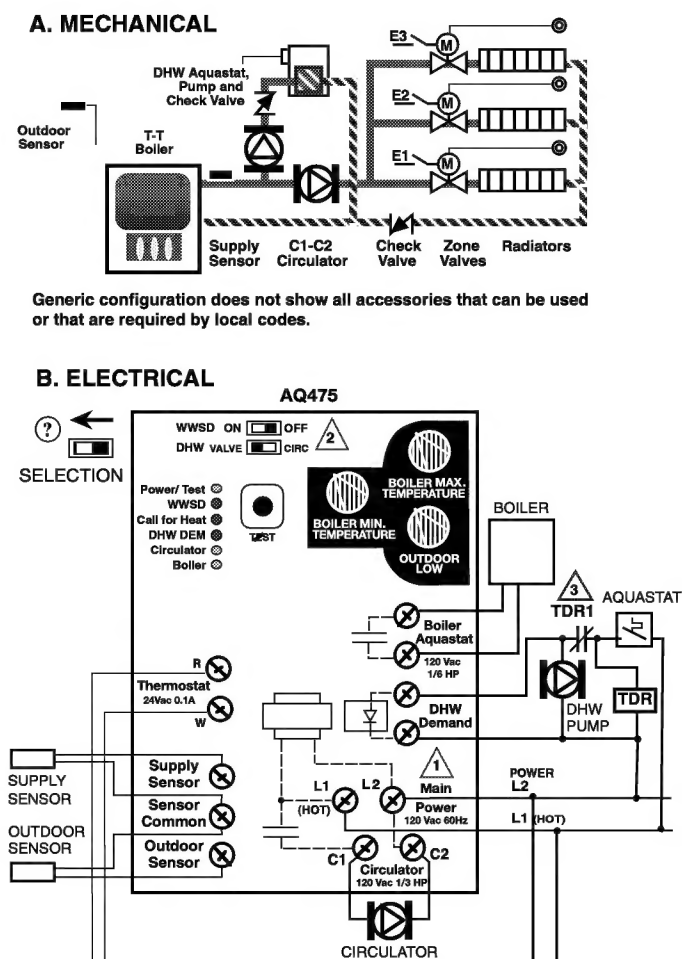
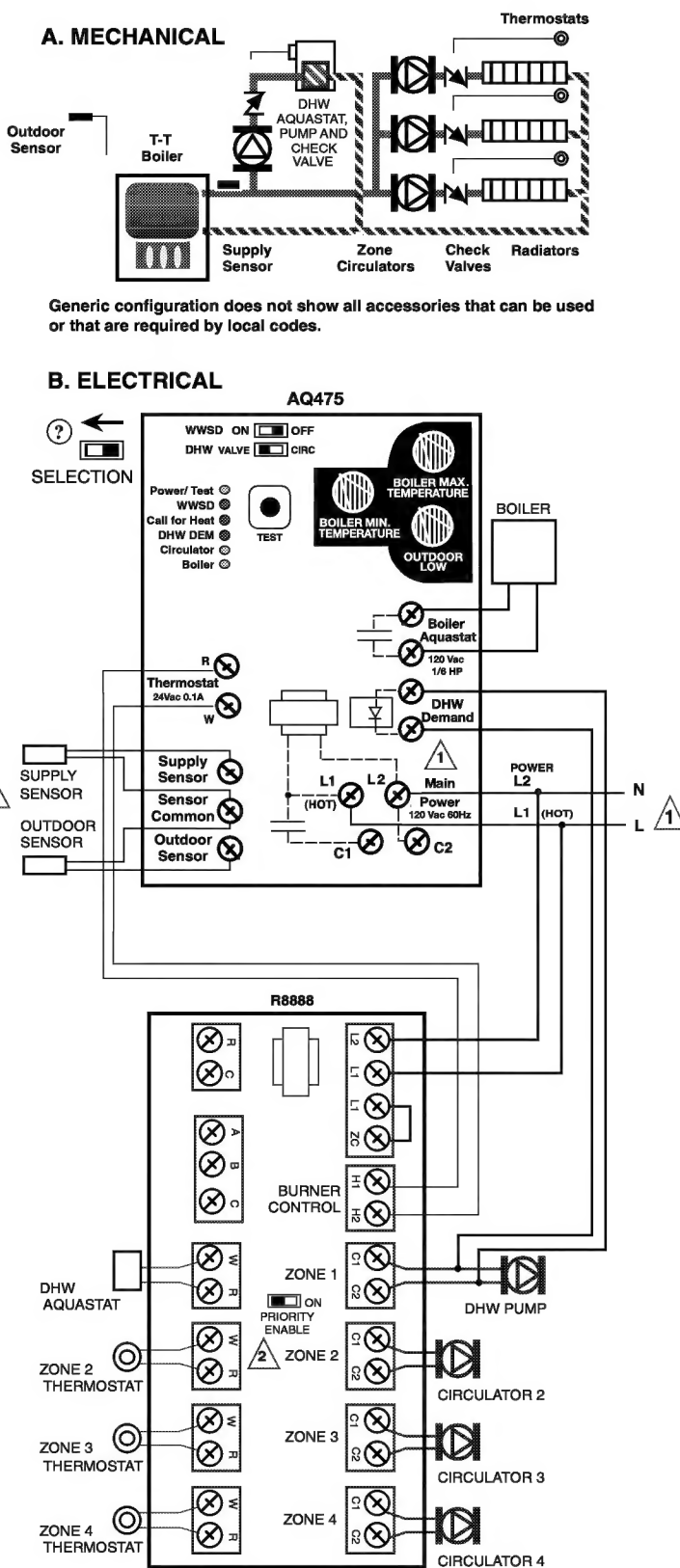


Fig. 8. Typical mechanical, wiring hookups for AQ475A, R8888 Hydronic Circulator Zone Panel with DHW priority.



1 Power supply. Provide disconnect means and overload protection as required.

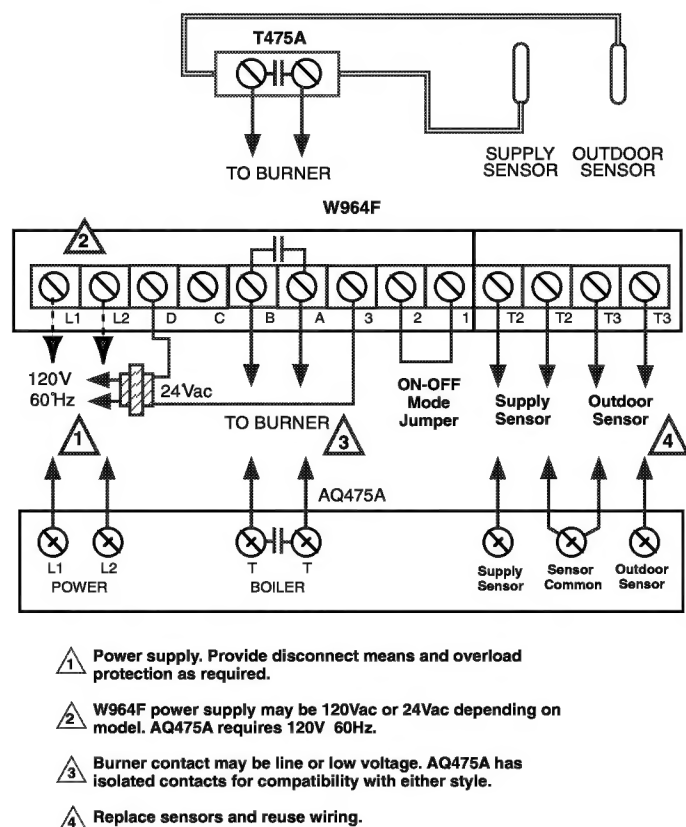
2 Set DHW switch to CIRC to disable main circulator for DHW priority.

3 20 — 30 minute time delay optional to limit DHW priority over space heating.

1 Power supply. Provide disconnect means and overload protection as required.

2 Slide Priority Enable switch to ON for DHW priority

Fig. 9. Typical wiring hookups for replacing T475A Outdoor Reset Controller, or W964F Aquatrol Outdoor Reset Controller configured for on-off control.



Boiler Minimum Temperature

Boiler minimum temperature control is activated when the Boiler Minimum Temperature dial is not set to OFF. Determine the setting based on the boiler manufacturer recommendations. This operation is only active when there is a call for heat from the space thermostat.

Notes:

- To prevent condensation of flue gases, do not set the Boiler Minimum Temperature dial lower than the manufacturer's recommendation. It is important that the supply sensor accurately reflects boiler temperature. See the Mounting section, Supply Sensor.
- The AQ475A Boiler Minimum Temperature setting does *NOT* replace the low limit function of a Triple Aquastat® Control.
- Make sure that the Boiler Minimum Temperature setting is *less than* the Boiler Maximum Temperature setting or reset control will be disabled.

Burner Differential

The AQ475A automatically calculates the best operating differential for the boiler. No installer setting is necessary or supplied.

Warm Weather Shut Down (WWSD)

Slide the WWSD slide switch to ON to activate warm weather shut down. When selected, the boiler will not turn on for a heat call if the outdoor temperature is above 70°F (21°C). The boiler only responds to DHW Demand in warm weather.

Domestic Hot Water Priority (DHW)

Supplying 24 to 240 Vac power to the DHW Demand input sets the boiler control point to the Boiler Maximum Temperature setting until the DHW call is satisfied. If DHW has its own circulator and requires absolute priority over space heating, set the DHW switch to PUMP to disable the main circulator during a call for domestic hot water. If DHW is controlled by a zone valve, set the DHW switch to VALVE.

Note: If domestic hot water has priority over heating, space temperature will not be maintained while there is a DHW call. To maintain comfort level in the event of DHW failure use a normally-closed 20 to 30 minute time-delay-on relay in series with the DHW input to limit the operation of DHW. See Fig. 5 for a typical wiring diagram.

Night Setback

Night setback control may be added to the system using a programmable thermostat. To minimize thermal stresses in the system during recovery periods, use a thermostat with a gradual warm-up, such as the Honeywell Chronotherm III™ or Chronotherm IV™ thermostat with the Adaptive Intelligent Recovery™ feature. Because the outdoor temperature compensator accurately calculates the heat required based on the outdoor temperature, allow at least two hours for recovery to the desired comfort temperature.

Note: The recovery time needed for high mass systems, such as thick slab radiant floor heating, is too long to make night setback practical.

OPERATION

The thermostat R-W heat input provides 0.10A at 24 Vac for power stealing thermostats or thermostats with heat anticipators. If the thermostat anticipator cannot be set lower than 0.15A, replace the thermostat or install a R8845U Universal Switching Relay to power the thermostat. If using a zone control relay box, use an isolated end switch to create the call for heat. The DHW Demand input requires 24 to 240 Vac from either a zone control relay box, zone valve, or Aquastat® Control. If using a relay box, the signal is provided from the zone output terminals and is typically 24 Vac. The circulator output is 120V switched from the power supply of the Aquatrol. The T-T boiler Aquatrol control output is an isolated and unpowered (dry) relay contact closure rated up to 120 Vac.

Note: The AQ475A performs the function of an operating (non-limit) Aquastat® Control. For consistent operation, set the existing operating control on the boiler to its highest setpoint if the boiler is started by zone thermostat(s) or zone valve end switches. If the existing boiler is not integrated to space temperature demand, for example, if the boiler runs at constant temperature and the thermostats control the circulators, set the operating control to its lowest setpoint and wire the AQ475A T-T outputs in parallel.

Call for Heat/Domestic Hot Water (DHW) Demand

On a call for heat, the thermostat, zone valve end switch, or zone panel closes the R-W input. The circulator relay turns on if the system is not in WWSD. The T-T boiler Aquastat® Control output contact makes to start the burner until the supply sensor is satisfied according to the calculated reset curve. 24 to 240 Vac supplied to the DHW Demand input forces the AQ475A to control the boiler at the Boiler Maximum

cont'd

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Heat/Domestic Hot Water (DHW) Demand cont'd

Temperature setting, and either turns the system circulator on (if the DHW switch is set to VALVE), or off (if the DHW switch is set to PUMP).

WWSD

WWSD does not allow the circulator or the boiler to run, even when a call for heat (R-W) is present. WWSD is enabled with a slide switch and occurs whenever the outdoor air temperature is warmer than 70°F (21°C). The WWSD LED turns on when it is selected and the outdoor temperature is warmer than 70°F (21°C). If a call for heat is made during WWSD, the Call for Heat LED also turns on. While in WWSD, if a DHW Demand occurs, the boiler operates at the Boiler Maximum Temperature setting until the demand is satisfied.

Boiler Operation

The reset ratio is determined by the adjustments Outdoor Low, Boiler Maximum Temperature, Boiler Minimum Temperature and a preset outdoor high temperature of 72°F (22°C). Once a call for heat is present, the control operates the boiler to reset the supply water temperature to a lower value that corresponds to the observed outdoor air temperature. When a DHW Demand is present, the control operates the boiler at the temperature set by the Boiler Maximum Temperature dial. The minimum boiler operating temperature is equal to the Boiler Minimum Temperature setting.

During the summer months, if the WWSD is turned off and a call for heat is present, the control operates the boiler at the Boiler Minimum Temperature setting. When a thermostat call for heat ends, the circulator runs for ten seconds to remove excess heat from the boiler.

Note: Factory supplied boiler controls can also energize the boiler independently from the AQ475A.

The boiler switching differential is automatically determined by the auto differential algorithm to optimize boiler cycling frequency.

Circulator Exercising

If the circulator has not been operated in the past 72 hours, the AQ475A turns on the C1-C2 output for ten seconds to reduce the chance of circulator seizure during the summer months.

LED Operation

- **Power/Test**
ON when power on to Compensator.
FLASHES during TEST mode.
- **WWSD (Summer Off)**
ON when Outdoor Temperature is above 70°F (21°C).
FLASHES if either supply or outdoor sensor fails.
- **Call for Heat (Thermostat On)**
ON when R-W input is shorted.
FLASHES if supply sensor fails or if control fails self-test.
- **DHW Dem. (Hot Water On)**
ON when there is a demand for domestic hot water.
FLASHES if control fails self-test.
- **Circulator**
ON when power supplied to circulator(s).
- **Boiler**
ON when T-T output made.

CHECKOUT AND TEST**Caution**

Electrical Shock or Equipment Damage Hazard.
Can shock individuals or short equipment circuitry.
Disconnect all power supplies before installation.

Press the Test button as follows to cycle the control through the test routine:

- First press—Control enters the test mode and Power/Test LED flashes.
- Second press—Circulator relay turns on.
- Third press—Boiler relay turns on.
- Fourth press—Circulator and boiler relays turn off and control exits the test routine.

NOTE: If the Test button is not pressed for five minutes during the test mode, the control automatically resumes normal operation.

Troubleshooting

Error	Results	Action
Outdoor Sensor fails (open or short circuit).	The control continues to operate assuming the outdoor temperature is 32°F (0°C) and the WWSD LED flashes. Space temperature may be too hot or too cold depending on outdoor temperature.	Check wiring for open or short circuit; if wiring is okay, replace the outdoor sensor.
Supply Sensor fails (open or short circuit).	The control turns on the circulator relay and boiler for up to 50% of a 20-minute cycle depending on the thermostat setting and DHW Demand. Both the WWSD and Call for Heat LEDs flash. Temperature may be too hot or too cold depending on outdoor temperature.	Check wiring for open or short circuit; if wiring is okay, replace the supply sensor.
Self-test sequence error.	The control attempts to operate normally. Both the Boiler and Call for Heat LEDs flash.	Replace the control.

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